Claims

1. A method for detecting multidrug resistance or multidrug resistance potential in a test neoplastic cell, comprising:

a) measuring a level of cell surface-expressed HSC70 protein in the test neoplastic cell of a given origin or cell type, and

b) comparing the level of cell surface-expressed HSC70 protein in the test neoplastic cell to the level of cell surface-expressed HSC70 in a nonresistant neoplastic cell of the same origin or cell type,

wherein the test neoplastic cell is multidrug resistant or has multidrug resistance potential if the level of cell surface-expressed HSC70 in the test neoplastic cell is greater than the level of cell surface-expressed HSC70 in the nonresistant neoplastic cell of the same given origin or cell type.

2. The method of claim 1, wherein measuring the level of cell surface-expressed HSC70 in the test neoplastic cell comprises isolating a cytoplasmic membrane fraction from the cell and measuring the level of HSC70 in the cytoplasmic membrane fraction.

3. The method of claim 1, wherein measuring the level of cell surface-expressed HSC70 in the test neoplastic cell comprises contacting said cell with an anti-HSC70 antibody and measuring the level of antibody bound to cell surface HSC70.

4. The method of claim 3, wherein measuring the level of antibody bound to cell surface HSC70 is by immunofluorescence emission.

5. The method of claim 3, wherein measuring the level of antibody bound to cell surface HSC70 is by radiolabel.

6. The method of claim 1, wherein the test neoplastic cell is selected from the group consisting of a promyleocytic leukemia cell, a T lymphoblastoid cell, a breast epithelial cell, and an ovarian cell.

7. The method of claim 1, wherein the nonresistant neoplastic cell is from a drug-sensitive cell line selected from the group consisting of HL60, NB4, CEM, HSB2 Molt4, MCF-7, MDA, SKOV-3, and 2008.

8. The method of claim 1, wherein the test neoplastic cell is selected from the group consisting of a lymphoma cell, a melanoma cell, a sarcoma cell, a leukemia cell, a retinoblastoma cell, a hepatoma cell, a myeloma cell, a glioma cell, a mesothelioma cell, and a carcinoma cell.

9. The method of claim 1, wherein the test neoplastic cell is from a tissue selected from the group consisting of blood, bone marrow, spleen, lymph node, liver, thymus, kidney, brain, skin, gastrointestinal tract, eye, breast, prostate, and ovary.

10. A method for detecting a multidrug resistant cell in a patient comprising:

(a) administering to the patient, a HSC70 binding agent operably linked to a detectable label; and

(b) detecting the label operably linked to the HSC70 binding agent,

wherein the HSC70 binding agent specifically binds to cell surface-expressed HSC70 present on a multidrug resistant cell in the patient.

11. The method of claim 10, wherein the HSC70 binding agent is an antibody or fragment thereof.

12. The method of claim 10, wherein the HSC70 binding agent is selected from the group consisting of Alzheimer's tau protein, BAG-1, small glutamine-rich tetratricopeptide repeat-containing protein (SGT), (aa 642-658) of rotavirus VP5 protein, auxilin, and the immunosuppressant 5-deoxyspergualin (DSG).

13. The method of claim 10, wherein the HSC70 binding agent is selected from the group consisting of natural ligands, synthetic small molecules, chemicals, nucleic acids, peptides, proteins, and antibodies.

14. The method of claim 10, wherein the detectable label is selected from the group consisting of fluorophores, chemical dyes, radioactive compounds, chemoluminescent compounds, magnetic compounds, paramagnetic compounds, promagnetic compounds, enzymes that yield a colored product, enzymes that yield a chemoluminescent product, and enzymes that yield a magnetic product.

15. The method of claim 14, wherein the multidrug resistant cell is a neoplastic cell.

16. The method of claim 15, wherein the neoplastic cell is selected from the group consisting of a breast cancer cell, an ovarian cancer cell, a myeloma cancer cell, a lymphoma cancer cell, a melanoma cancer cell, a sarcoma cancer cell, a leukemia cancer cell, a retinoblastoma cancer cell, a hepatoma cancer cell, a glioma cancer cell, a mesothelioma cancer cell, and a carcinoma cancer cell.

17. The method of claim 15, wherein the neoplastic cell is selected from the group consisting of a promyleocytic leukemia cell, a T lymphoblastoid cell, a breast epithelial cell, and an ovarian cell.

18. The method of claim 10, wherein the patient is a human.

19. The method of claim 18, wherein the patient is suffering from a disease or disorder caused by the presence of the multidrug resistant cell.

20. A kit for diagnosing or detecting multidrug resistance in a test neoplastic cell comprising:

a) a first probe for the detection of HSC70; and

b) a second probe for the detection of a multidrug resistance marker selected from the group consisting of nucleophosmin and HSC70.

21. A kit for diagnosing or detecting multidrug resistance in a test neoplastic cell comprising:

a) a first probe for the detection of HSC70; and

b) a second probe for the detection of a marker selected from the group consisting of MDR1, MDR3, MRP1, MRP5, and LRP.

22. The kit of claim 20 or 21, wherein the probe for detecting HSC70 is an anti-HSC70 antibody.

23. The kit of claim 20 or 21, wherein the probe for detecting HSC70 is an HSC70 ligand selected from the group consisting of Alzheimer's tau protein, BAG-1, small glutamine-rich tetratricopeptide repeat-containing protein (SGT), (aa 642-658) of rotavirus VP5 protein, auxilin, and the immunosuppressant 5-deoxyspergualin (DSG).

24. The kit of claim 20, wherein the second probe is selected from the group consisting of a nucleophosmin antibody and a vimentin antibody.

25. The kit of claim 20, wherein the second probe is selected from the group consisting of a nucleophosmin ligand and a vimentin ligand.

26. The kit of claim 20 or 21, wherein the first probe detects HSC70 present on the surface of the test neoplastic cell.

27. The kit of claim 20 or 21, wherein the second probe detects a marker present of the surface of the test neoplastic cell.

28. The kit of claim 21, wherein the second probe is selected from the group consisting of: an MDR1 antibody, an MDR3 antibody, an MRP1 antibody, an MRP3 antibody, and an LRP antibody.

29. A cell surface HSC70 *in situ* detection probe for the detection of cell surface HSC70 in a patient, comprising a HSC70 binding component and a detectable label for detection *in situ*.

30. The cell surface HSC70 *in situ* detection probe of claim 29, wherein the HSC70 binding component is an antibody.

31. The cell surface HSC70 *in situ* detection probe of claim 29, wherein the detectable label is Technetium.

32. A cell surface HSC70-targeted agent for treating or preventing a multi-drug resistant neoplasm, comprising a HSC70 binding component and a therapeutic component, wherein the HSC70 binding component targets the therapeutic component to the multi-drug resistant neoplasm and thereby treats the multi-drug resistant neoplasm.

33. The agent of claim 32, wherein the HSC70 binding component is an anti-HSC70 antibody.

34. The agent of claim 32, wherein the HSC70 binding component is selected from the group consisting of Alzheimer's tau protein, BAG-1, small glutamine-rich tetratricopeptide repeat-containing protein (SGT), (aa 642-658) of rotavirus VP5 protein, auxilin, and the immunosuppressant 5-deoxyspergualin (DSG).

35. The agent of claim 32, wherein said HSC70 binding component is selected from the group consisting of natural ligands, synthetic small molecules, chemicals, nucleic acids, peptides, proteins, antibodies, and HSC70 binding fragments thereof.

36. The agent of claim 32, wherein the therapeutic component is selected from the group consisting of Actinomycin, Adriamycin, Altretamine, Asparaginase, Bleomycin, Busulfan, Capecitabine, Carboplatin, Carmustine, Chlorambucil, Cisplatin, Cladribine, Cyclophosphamide, Cytarabine, Dacarbazine, Dactinomycin, Daunorubicin, Docetaxel, Doxorubicin, Epoetin, Etoposide, Fludarabine, Fluorouracil, Gemcitabine, Hydroxyurea, Idarubicin, Ifosfamide, Imatinib, Irinotecan, Lomustine, Mechlorethamine, Melphalan, Mercaptopurine, Methotrexate, Mitomycin, Mitotane, Mitoxantrone, Paclitaxel, Pentostatin, Procarbazine, Taxol, Teniposide, Topotecan, Vinblastine, Vincristine, and Vinorelbine.

37. The agent of claim 32, wherein the therapeutic component is in a liposome formulation.

38. The agent of claim 32, wherein the therapeutic component is a radioisotope.

39. The agent of claim 38, wherein the radioisotope is selected from the group consisting of ^{90}Y, ^{125}I, ^{131}I, ^{211}At, and ^{213}Bi.

40. The agent of claim 32, wherein the therapeutic component is a toxin capable of killing or inducing the killing of the targeted multi-drug resistant neoplastic cell.

41. The agent of claim 40, wherein the toxin is selected from the group consisting of a Pseudomonas exotoxin, a diphtheria toxin, a plant ricin toxin, a plant abrin toxin, a plant saporin toxin, a plant gelonin toxin, and pokeweed antiviral protein.

42. The agent of any of claims 32-41, wherein the HSC70 binding component binds to the surface of the target cell and the therapeutic element is internalized and arrests growth of the cell, compromises viability of the cell or kills the cell.

43. A vaccine for treating or preventing a multi-drug resistant neoplasm, comprising a HSC70 polypeptide, or HSC70 polypeptide subsequence thereof, and at least one pharmaceutically acceptable vaccine component.

44. The vaccine of claim 43, wherein the HSC70 polypeptide or polypeptide subsequence is a human HSC70 polypeptide sequence of SEQ ID NO.: 1.

45. The vaccine of claim 43, wherein the HSC70 polypeptide subsequence is at least eight amino acids long.

46. The vaccine of claim 45, wherein the HSC70 polypeptide subsequence comprises a hapten.

47. The vaccine of claim 43, wherein the pharmaceutically acceptable vaccine component is an adjuvant.

48. The vaccine of claim 47, wherein the adjuvant is selected from the group consisting of aluminum hydroxide, aluminum phosphate, calcium phosphate, oil emulsion, a bacterial product, whole inactivated bacteria, an endotoxins, cholesterol, a fatty acid, an aliphatic amine, a paraffinic compound, a vegetable oil, monophosphoryl lipid A, a saponin, and squalene.

49. A method of treating or preventing a multidrug resistant neoplasm in a subject comprising administering a cell surface HSC70-targeted therapeutic agent of any of claims 32-41.

50. The method of claim 49, wherein the neoplasm is selected from the group consisting of a breast cancer, an ovarian cancer, a myeloma, a lymphoma, a melanoma, a sarcoma, a leukemia, a retinoblastoma, a hepatoma, a glioma, a mesothelioma, and a carcinoma.

51. The method of claim 49, wherein the subject is a human patient.

52. The method of claim 51, wherein the human patient is suffering from a disease or disorder caused by the presence of the multi-drug resistant cell.

53. The method of claim 49, wherein the neoplasm is from a tissue selected from the group consisting of blood, bone marrow, spleen, lymph node, liver, thymus, kidney, brain, skin, gastrointestinal tract, eye, breast, prostate, and ovary.

54. A method of treating or preventing a multidrug resistant neoplasm in a subject comprising administering a HSC70 vaccine of any of claims 43-48.

55. The method of claim 54, wherein the neoplasm is selected from the group consisting of a breast cancer, an ovarian cancer, a myeloma, a lymphoma, a melanoma, a sarcoma, a leukemia, a retinoblastoma, a hepatoma, a glioma, a mesothelioma, and a carcinoma.

56. The method of claim 54, wherein the subject is a human patient.

57. The method of claim 56, wherein the human patient is suffering from a disease or disorder caused by the presence of the multi-drug resistant cell.

58. The method of claim 54, wherein the neoplasm is from a tissue selected from the group consisting of blood, bone marrow, spleen, lymph node, liver, thymus, kidney, brain, skin, gastrointestinal tract, eye, breast, prostate, and ovary.

59. A method for detecting whether a test cell is neoplastic comprising

a) measuring a level of cell surface-expressed HSC70 protein in the test cell of a given origin or cell type, and

b) comparing the level of cell surface-expressed HSC70 protein in the test cell to the level of cell surface-expressed HSC70 in a nonneoplastic cell of the same origin or cell type,

wherein the test cell is neoplastic if the level of cell surface-expressed HSC70 in the test cell is greater than the level of cell surface-expressed HSC70 in the nonneoplastic cell of the same origin or cell type.

60. The method of claim 59, wherein measuring the level of cell surface-expressed HSC70 in the test cell comprises isolating a cytoplasmic membrane fraction from the cell and measuring the level of HSC70 in the cytoplasmic membrane fraction.

61. The method of claim 59, wherein measuring the level of cell surface-expressed HSC70 in the test cell comprises contacting said cell with an anti-HSC70 antibody and measuring the level of antibody bound to cell surface HSC70.

62. The method of claim 61, wherein measuring the level of antibody bound to cell surface HSC70 is by immunofluorescence emission.

63. The method of claim 61, wherein measuring the level of antibody bound to cell surface HSC70 is by radiolabel.

64. The method of claim 59, wherein the test cell is from a tissue selected from the group consisting of blood, bone marrow, spleen, lymph node, liver, thymus, kidney, brain, skin, gastrointestinal tract, eye, breast, prostate, and ovary.

65. The method of claim 59, wherein the nonneoplastic cell is from a tissue selected from the group consisting of blood, bone marrow, spleen, lymph node, liver, thymus, kidney, brain, skin, gastrointestinal tract, eye, breast, prostate, and ovary.

66. A method for detecting a neoplastic cell in a patient comprising:

(a) administering to the patient, a HSC70 binding agent operably linked to a detectable label; and

(b) detecting the label operably linked to the HSC70 binding agent,

wherein the HSC70 binding agent specifically binds to cell surface-expressed HSC70 present on a neoplastic cell in the patient.

67. The method of claim 66, wherein the HSC70 binding agent is an antibody or fragment thereof.

68. The method of claim 66, wherein the HSC70 binding agent is selected from the group consisting of Alzheimer's tau protein, BAG-1, small glutamine-rich tetratricopeptide repeat-containing protein (SGT), (aa 642-658) of rotavirus VP5 protein, auxilin, and immunosuppressant 5-deoxyspergualin (DSG).

69. The method of claim 66, wherein the HSC70 binding agent is selected from the group consisting of natural ligands, synthetic small molecules, chemicals, nucleic acids, peptides, proteins, antibodies, and fragments thereof.

70. The method of claim 66, wherein the detectable label is selected from the group consisting of fluorophores, chemical dyes, radioactive compounds, chemoluminescent compounds, magnetic compounds, paramagnetic compounds, promagnetic compounds, enzymes that yield a colored product, enzymes that yield a chemoluminescent product, and enzymes that yield a magnetic product.

71. The method of claim 66, wherein the neoplastic cell is selected from the group consisting of a breast cancer cell, an ovarian cancer cell, a myeloma cancer cell, a lymphoma cancer cell, a melanoma cancer cell, a sarcoma cancer cell, a leukemia cancer cell, a retinoblastoma cancer cell, a hepatoma cancer cell, a glioma cancer cell, a mesothelioma cancer cell, and a carcinoma cancer cell.

72. The method of claim 66, wherein the neoplastic cell is selected from the group consisting of a promyleocytic leukemia cell, a T lymphoblastoid cell, a breast epithelial cell, and an ovarian cell.

73. The method of claim 66, wherein the patient is a human.

74. The method of claim 73, wherein the patient is suffering from a disease or disorder caused by the presence of the neoplastic cell.

75. A kit for diagnosing or detecting neoplasia, comprising:

a) a first probe for the detection of HSC70; and

b) a second probe for the detection of a neoplasia marker selected from the group consisting of nucleophosmin and HSC70.

76. The kit of claim 75, wherein the probe for detecting HSC70 is an anti-HSC70 antibody or binding fragment thereof.

77. The kit of claim 75, wherein the probe for detecting HSC70 is a HSC70 ligand selected from the group consisting of Alzheimer's tau protein, BAG-1, small glutamine-rich tetratricopeptide repeat-containing protein (SGT), (aa 642-658) of rotavirus VP5 protein, auxilin, and the immunosuppressant 5-deoxyspergualin (DSG).

78. The kit of claim 75, wherein the second probe is selected from the group consisting of a nucleophosmin antibody and an HSC70 antibody.

79. The kit of claim 75, wherein the second probe is selected from the group consisting of a nucleophosmin ligand and a vimentin ligand.

80. The kit of claim 75, wherein the first probe detects HSC70 present on the surface of the test cell if it is neoplastic.

81. The kit of claim 75, wherein the second probe detects a marker present of the surface of the test cell if it is neoplastic.

82. A cell surface HSC70-targeted agent for treating a cancerous neoplastic cell growth comprising a HSC70 binding component and a therapeutic component, wherein the HSC70 binding component targets the therapeutic component to the neoplastic cell growth and thereby treats the cancer.

83. The agent of claim 82, wherein the HSC70 binding component is an anti-HSC70 antibody.

84. The agent of claim 82, wherein the HSC70 binding component is selected from the group consisting of Alzheimer's tau protein, BAG-1, small glutamine-rich tetratricopeptide repeat-

containing protein (SGT), (aa 642-658) of rotavirus VP5 protein, auxilin, and the immunosuppressant 5-deoxyspergualin (DSG).

85. The agent of claim 82, wherein said HSC70 binding component is selected from the group consisting of natural ligands, synthetic small molecules, chemicals, nucleic acids, peptides, proteins, antibodies, and HSC70 binding fragments thereof.

86. The agent of claim 82, wherein the therapeutic component is selected from the group consisting of Actinomycin, Adriamycin, Altretamine, Asparaginase, Bleomycin, Busulfan, Capecitabine, Carboplatin, Carmustine, Chlorambucil, Cisplatin, Cladribine, Cyclophosphamide, Cytarabine, Dacarbazine, Dactinomycin, Daunorubicin, Docetaxel, Doxorubicin, Epoetin, Etoposide, Fludarabine, Fluorouracil, Gemcitabine, Hydroxyurea, Idarubicin, Ifosfamide, Imatinib, Irinotecan, Lomustine, Mechlorethamine, Melphalan, Mercaptopurine, Methotrexate, Mitomycin, Mitotane, Mitoxantrone, Paclitaxel, Pentostatin, Procarbazine, Taxol, Teniposide, Topotecan, Vinblastine, Vincristine, and Vinorelbine and combinations thereof.

87. The agent of claim 82, wherein the therapeutic component is in a liposome formulation.

88. The agent of claim 82, wherein the therapeutic component is a radioisotope.

89. The agent of claim 88, wherein the radioisotope is selected from the group consisting of ^{90}Y, ^{111}In, ^{125}I, ^{131}I, ^{211}At, and ^{213}Bi.

90. The agent of claim 82, wherein the therapeutic component is a toxin capable of killing or inducing the killing of the targeted neoplastic cell.

91. The agent of claim 90, wherein the toxin is selected from the group consisting of a Pseudomonas exotoxin, a diphtheria toxin, a plant ricin toxin, a plant abrin toxin, a plant saporin toxin, a plant gelonin toxin, and pokeweed antiviral protein.

92. The agent of any of claims 82-91, wherein the HSC70 binding component binds to the surface of the target cell and the therapeutic element is internalized and arrests growth of the cell, compromises viability of the cell, or kills the cell.

93. A vaccine for treating or preventing a neoplasm comprising a HSC70 polypeptide, or HSC70 polypeptide subsequence thereof, and at least one pharmaceutically acceptable vaccine component.

94. The vaccine of claim 93, wherein the HSC70 polypeptide or polypeptide subsequence is a human HSC70 polypeptide sequence set forth in SEQ ID NO.: 1.

95. The vaccine of claim 93, wherein the HSC70 polypeptide subsequence is at least eight amino acids long.

96. The vaccine of claim 95, wherein the HSC70 polypeptide subsequence comprises a hapten.

97. The vaccine of claim 93, wherein the pharmaceutically acceptable vaccine component is an adjuvant.

98. The vaccine of claim 97, wherein the adjuvant is selected from the group consisting of aluminum hydroxide, aluminum phosphate, calcium phosphate, oil emulsion, a bacterial product, whole inactivated bacteria, an endotoxins, cholesterol, a fatty acid, an aliphatic amine, a paraffinic compound, a vegetable oil, monophosphoryl lipid A, a saponin, and squalene.

99. A method of treating or preventing a neoplasm in a subject comprising administering a cell surface HSC70-targeted therapeutic agent of any of claims 82-91.

100. The method of claim 99, wherein the neoplasm is selected from the group consisting of a breast cancer, an ovarian cancer, a myeloma, a lymphoma, a melanoma, a sarcoma, a leukemia, a retinoblastoma, a hepatoma, a glioma, a mesothelioma, and a carcinoma.

101. The method of claim 99, wherein the subject is a human patient.

102. The method of claim 101, wherein said human patient is suffering from a disease or disorder caused by the presence of the multi-drug resistant cell.

103. The method of claim 99, wherein the neoplasm is from a tissue selected from the group consisting of blood, bone marrow, spleen, lymph node, liver, thymus, kidney, brain, skin, gastrointestinal tract, eye, breast, prostate and ovary.

104. A method of treating or preventing a neoplasm in a subject comprising administering a HSC70 vaccine of any of claims 93-98.

105. The method of claim 104, wherein the neoplasm is selected from the group consisting of a breast cancer, an ovarian cancer, a myeloma, a lymphoma, a melanoma, a sarcoma, a leukemia, a retinoblastoma, a hepatoma, a glioma, a mesothelioma, and a carcinoma.

106. The method of claim 104, wherein said subject is a human patient.

107. The method of claim 106, wherein said human patient is suffering from a disease or disorder caused by the presence of the neoplastic cell.

108. The method of claim 104, wherein the neoplasm is from a tissue selected from the group consisting of blood, bone marrow, spleen, lymph node, liver, thymus, kidney, brain, skin, gastrointestinal tract, eye, breast, prostate, and ovary.